



The **CRUSHED STONE JOURNAL**

PUBLISHED QUARTERLY

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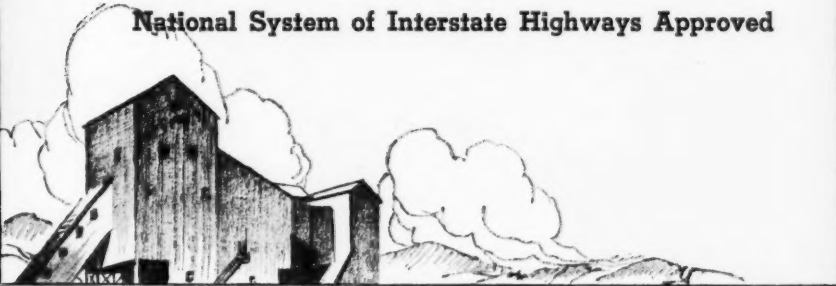
■
**The National Crushed Stone Association Safety
Competition of 1946**

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**A Report on the Condition of the Experimental Bitumi-
nous Surface Treatments on Route 9-W South of Albany,
N. Y., After Four Years of Heavy Service**

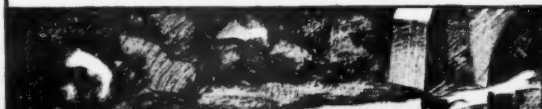
■
**Agricultural Limestone Division Expands Promotional
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■
National System of Interstate Highways Approved

December • 1947



Official Publication
NATIONAL CRUSHED STONE ASSOCIATION



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The Crushed Stone Journal

Official Publication of the NATIONAL CRUSHED STONE ASSOCIATION

J. R. BOYD, Editor

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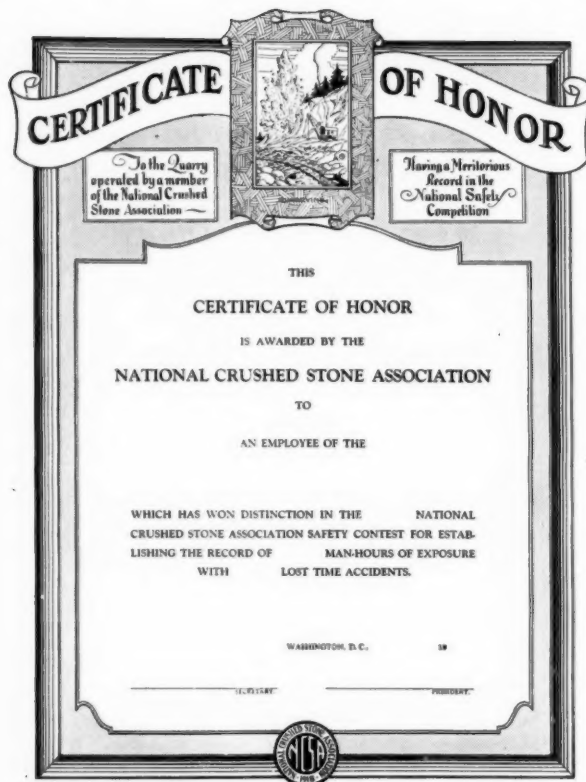
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THIS Certificate of Honor will be presented to each employee of each plant which completed the year 1946 with no lost time accidents.

THE CRUSHED STONE JOURNAL

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DECEMBER, 1947

The National Crushed Stone Association Safety Competition of 1946

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R. W. ARTHUR

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Economics and Statistics Branch,
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Washington, D. C.

THE injury-severity rate at quarries and mines in the 1946 National Crushed Stone Association Safety Competition was the fourth lowest in the 21-year history of the annual contests conducted by the Bureau of Mines, U. S. Department of the Interior. The 54 crushed stone operations in the Competition—46 open quarries and 8 underground mines—had a severity rate of 3.359 days lost per thousand man-hours of work which was well below the 21-year average rate of 5.682. However, the severity in 1946 was more than triple the corresponding rate of 1.093 in 1945 which was the lowest on record. Injuries occurred at a rate of 27.692 per million man-hours, a more favorable rate than the 1926-46 average but less favorable than the 1945 rate. Accident-free records were achieved in 1946 by 12 plants—11 quarries and 1 underground mine—which were operated a total of 847,990 man-hours.

The 54 competing plants in the 1946 Competition were worked 8,630,738 man-hours, the largest annual total worktime in any contest year except in 1929. There were 3 fatalities and 8 permanent partial disabilities charged respectively with totals of 18,000 and 5,816 days lost in accordance with the standard time-loss scale. The 228 temporary lost-time injuries had an average of 23 days disability per injury. All told, 28,991 days were lost through injuries at the

enrolled plants, an economic loss of production equivalent approximately to 100 men working 290 full shifts.

Although the 1946 safety record of the 46 open quarries in the contest receded from 1945, the injury-severity rate was less than half the 21-year average rate and the frequency rate of injuries was moderately lower than the corresponding average rate for 1926-46. At the 8 underground mines in the 1946 Competition, the severity rate was more than triple the corresponding rate in 1945 and was well above the 21-year average rate. Injuries occurred more frequently in 1946 at these underground mines and the frequency rate increased to 26.15 from 19.37 per million man-hours in 1945.

Winning Plant

The Le Roy quarry of The General Crushed Stone Company at Le Roy, Genesee County, New York had the best safety record in 1946, and the bronze plaque provided by the Explosives Engineer magazine was awarded to this operation. Employees worked 110,850 man-hours and achieved a perfect safety record without a disabling accident during the year. The 1946 trophy was the first awarded to the Le Roy quarry which has been enrolled each year since the contests began in 1926. However, this operation has had injury-free records in 5 other of the past 21 years and was awarded a Certificate of Honorable Mention for these accomplishments in 1934, 1936, 1938, 1940, and 1943. During the 21 years this quarry was in operation a total of 2,641,436 man-hours with an

TABLE I
RELATIVE STANDING OF QUARRIES IN THE 1946 NATIONAL CRUSHED STONE ASSOCIATION SAFETY
COMPETITION, BASED UPON THE ACCIDENT-SEVERITY RATES OF THE QUARRIES¹

Rank of plant	Man- hours worked	Number of injuries ²					Average days of disability per temp. injury	Number of days of disability ²					Frequency rate ²	Severity rate ²
		F.	P.T.	P.P.	Temp.	Total		F.	P.T.	P.P.	Temp.	Total		
1	110,850	—	—	—	—	—	—	—	—	—	—	—	0.000	0.000
2	110,155	—	—	—	—	—	—	—	—	—	—	—	.000	.000
3	86,978	—	—	—	—	—	—	—	—	—	—	—	.000	.000
5	79,055	—	—	—	—	—	—	—	—	—	—	—	.000	.000
6	70,098	—	—	—	—	—	—	—	—	—	—	—	.000	.000
7	69,654	—	—	—	—	—	—	—	—	—	—	—	.000	.000
8	57,822	—	—	—	—	—	—	—	—	—	—	—	.000	.000
9	57,690	—	—	—	—	—	—	—	—	—	—	—	.000	.000
10	49,822	—	—	—	—	—	—	—	—	—	—	—	.000	.000
11	46,497	—	—	—	—	—	—	—	—	—	—	—	.000	.000
12	28,350	—	—	—	—	—	—	—	—	—	—	—	.000	.000
13	230,552	—	—	—	4	4	3	—	—	—	10	10	17.350	.043
14	136,234	—	—	—	2	2	3	—	—	—	6	6	14.681	.044
15	305,638	—	—	—	1	1	15	—	—	—	15	15	3.272	.049
16	69,317	—	—	—	1	1	4	—	—	—	4	4	14.426	.058
18	157,976	—	—	—	5	5	5	—	—	—	26	26	31.650	.165
19	160,537	—	—	—	3	3	10	—	—	—	29	29	18.687	.181
21	259,969	—	—	—	1	1	57	—	—	—	57	57	3.847	.219
22	169,725	—	—	—	3	3	14	—	—	—	42	42	17.676	.247
23	455,452	—	—	—	6	6	20	—	—	—	120	120	13.174	.263
24	124,175	—	—	—	1	1	40	—	—	—	40	40	8.053	.322
25	206,913	—	—	—	8	8	9	—	—	—	70	70	38.664	.338
26	85,600	—	—	—	8	8	4	—	—	—	31	31	93.458	.362
27	107,780	—	—	—	3	3	15	—	—	—	46	46	27.834	.427
28	82,434	—	—	—	5	5	7	—	—	—	36	36	60.655	.437
29	68,120	—	—	—	3	3	10	—	—	—	31	31	44.040	.455
30	309,150	—	—	—	10	10	16	—	—	—	159	159	32.347	.514
31	120,640	—	—	—	4	4	16	—	—	—	62	62	33.155	.514
32	57,971	—	—	—	4	4	8	—	—	—	31	31	69.000	.535
33	214,902	—	—	—	6	6	22	—	—	—	134	134	27.920	.624
34	342,024	—	—	—	11	11	20	—	—	—	223	223	32.161	.652
35	82,284	—	—	—	3	3	18	—	—	—	54	54	36.459	.653
36	85,525	—	—	—	1	1	60	—	—	—	60	60	11.692	.702
37	478,489	—	—	—	16	16	21	—	—	—	338	338	33.439	.706
38	33,170	—	—	—	1	1	24	—	—	—	24	24	30.148	.724
40	546,210	—	—	1	12	13	36	—	—	75	429	504	23.800	.923
41	87,365	—	—	—	3	3	27	—	—	—	82	82	34.339	.939
42	200,330	—	—	1	3	4	14	—	—	150	41	191	19.967	.953
45	234,789	—	—	—	11	11	30	—	—	—	326	326	46.851	1.388
46	85,120	—	—	—	2	2	75	—	—	—	150	150	23.496	1.762
47	15,240	—	—	—	5	5	10	—	—	—	51	51	328.084	3.346
49	262,080	—	—	1	13	14	35	—	—	450	449	899	53.419	3.430
50	314,869	—	—	1	32	33	28	—	—	266	889	1,155	104.805	3.668
51	213,600	—	—	1	3	4	7	—	—	1,800	22	1,822	18.727	8.530
52	159,408	—	—	1	3	4	14	—	—	2,400	43	2,443	25.093	15.325
54	61,916	1	—	—	—	1	—	6,000	—	—	—	6,000	16.151	96.905
Totals and rates 1946 7,292,175														
		1	—	6	197	204	21	6,000	—	5,141	4,130	15,271	27.975	2.094
Totals and rates 1945 6,087,037														
		—	—	1	135	136	26	—	—	750	3,505	4,255	22.343	0.699

¹ As reports from mining companies are considered confidential by the Bureau of Mines, the identities of the plants to which this table relates are not revealed.

² F., fatal; P.T., permanent total disability; P.P., permanent partial disability; Temp., temporary disability.

³ Frequency rate indicates the number of fatal, permanent, and other disabling injuries per million man-hours of exposure; severity rate indicates number of days of disability lost from injuries per thousand man-hours of exposure.

TABLE II

RELATIVE STANDING OF UNDERGROUND MINES IN THE 1946 NATIONAL CRUSHED STONE ASSOCIATION SAFETY COMPETITION, BASED UPON THE ACCIDENT-SEVERITY RATES OF THE MINES ¹

Rank of plant	Man-hours worked	Number of injuries ¹					Average days of disability per temp. injury	Number of days of disability ¹					Frequency rate ¹	Severity rate ¹
		F.	P.T.	P.P.	Temp.	Total		F.	P.T.	P.P.	Temp.	Total		
4	81,319	—	—	—	—	—	—	—	—	—	—	—	0.000	0.000
17	159,020	—	—	—	1	1	20	—	—	—	20	20	6.289	.126
20	76,480	—	—	—	3	3	5	—	—	—	14	14	39.226	.183
39	38,221	—	—	—	2	2	16	—	—	—	32	32	52.327	.837
43	319,652	—	—	—	10	10	38	—	—	—	382	382	31.284	1.195
44	312,653	—	—	—	9	9	45	—	—	—	407	407	28.786	1.302
48	51,657	—	—	—	5	5	35	—	—	—	176	176	96.792	3.407
53	299,561	2	—	2	1	5	14	12,000	—	675	14	12,689	16.691	42.359
Totals and rates, 1946	1,338,563	2	—	2	31	35	34	12,000	—	675	1,045	13,720	26.147	10.250
Totals and rates, 1945	1,238,845	—	—	2	22	24	34	—	—	3,000	755	3,755	19.373	3.031

¹ See footnotes 1, 2, and 3, Table 1.

TABLE III

YEARLY SUMMARY—QUARRIES IN THE NATIONAL CRUSHED STONE ASSOCIATION SAFETY COMPETITION, 1926-46 ¹

Year	Plants	Man-hours worked	Number of injuries ¹					Number of days of disability ¹					Frequency rate ¹	Severity rate ¹
			Fatal	P.T.	P.P.	Temp.	Total	Fatal	P.T.	P.P.	Temp.	Total		
1926	40	5,298,983	3	—	6	207	216	18,000	—	9,000	4,239	31,239	40.763	5.895
1927	48	7,876,791	9	—	2	458	469	54,000	—	2,100	7,186	63,286	59.542	8.034
1928	53	7,509,098	8	—	4	322	334	48,000	—	8,700	5,493	62,193	44.479	8.282
1929	53	7,970,325	4	—	5	286	295	24,000	—	5,760	5,533	35,293	37.012	4.428
1930	68	8,013,415	6	—	9	227	242	36,000	—	7,250	3,671	46,921	30.199	5.855
1931	58	5,085,857	4	—	13	198	215	24,000	—	18,660	3,540	46,200	42.274	9.084
1932	40	2,661,850	1	—	4	75	80	6,000	—	6,750	2,481	15,231	30.054	5.722
1933	40	2,704,871	1	—	1	67	69	6,000	—	48	2,893	8,941	25.510	3.306
1934	46	3,288,257	1	—	2	106	109	6,000	—	2,850	1,873	10,723	33.148	3.261
1935	46	4,166,306	2	1	8	77	88	12,000	6,000	9,900	3,015	30,915	21.122	7.420
1936	50	6,399,023	5	—	14	182	201	30,000	—	8,168	4,590	42,758	31.411	6.682
1937	47	6,199,001	7	—	9	136	152	42,000	—	5,875	4,461	52,336	24.520	8.443
1938	47	4,658,119	2	—	6	76	84	12,000	—	6,600	3,184	21,784	18.033	4.677
1939	44	4,219,086	2	—	2	51	55	12,000	—	4,800	1,678	18,478	13.036	4.380
1940	46	4,358,409	1	—	5	78	84	6,000	—	2,550	3,013	11,563	19.273	2.653
1941	47	5,777,587	3	—	5	98	106	18,000	—	9,300	2,266	29,566	18.347	5.117
1942	48	7,178,935	3	2	1	183	189	18,000	12,000	1,500	4,239	35,739	26.327	4.978
1943	34	4,750,314	4	—	5	134	143	24,000	—	7,146	3,862	35,003	30.103	7.370
1944	32	3,996,433	3	—	4	118	125	18,000	—	3,000	3,323	24,323	31.278	6.086
1945	46	6,087,037	—	—	1	135	136	—	—	750	3,505	4,255	22.343	0.699
1946	46	7,292,175	1	—	6	197	204	6,000	—	5,141	4,130	15,271	27.975	2.094
Total	—	115,491,872	70	3	112	3,411	3,596	420,000	18,000	125,848	78,175	642,023	31.136	5.559

¹ See footnotes 1, 2, and 3, Table I.

TABLE IV
YEARLY SUMMARY—UNDERGROUND MINES IN THE NATIONAL CRUSHED STONE ASSOCIATION SAFETY COMPETITION, 1926-46¹

Year	Plants	Man-hours worked	Number of injuries ¹					Number of days of disability ¹					Frequency rate ¹	Severity rate ¹
			Fatal	P.T.	P.P.	Temp.	Total	Fatal	P.T.	P.P.	Temp.	Total		
1926	3	517,926	—	—	—	34	34	—	—	—	533	533	65.646	1.029
1927	2	318,449	1	—	1	14	16	6,000	—	300	68	6,368	50.244	19.997
1928	5	542,193	1	—	1	68	70	6,000	—	300	888	7,188	129.105	13.257
1929	4	665,520	1	—	1	30	32	6,000	—	300	617	6,917	48.083	10.393
1930	6	595,367	1	—	1	15	17	6,000	—	225	468	6,693	28.554	11.242
1931	3	345,105	—	—	—	4	4	—	—	—	147	147	11.591	.426
1932	2	158,450	—	—	—	6	6	—	—	—	165	165	37.867	1.041
1933	3	229,381	—	—	—	11	11	—	—	—	349	349	47.955	1.521
1934	4	248,146	—	—	—	13	13	—	—	—	287	287	52.389	1.157
1935	2	175,584	—	—	—	3	3	—	—	—	249	249	17.046	1.415
1936	4	334,747	1	—	—	7	8	6,000	—	—	117	6,117	23.899	18.274
1937	3	364,680	—	—	—	3	3	—	—	—	91	91	8.226	.250
1938	3	334,442	—	—	—	2	2	—	—	—	133	133	5.980	.398
1939	4	393,039	—	—	1	7	8	—	—	600	457	1,057	20.354	2.689
1940	4	375,987	—	—	1	8	9	—	—	4,500	888	5,388	23.737	14.330
1941	4	591,568	—	—	1	15	16	—	—	750	169	919	27.047	1.553
1942	4	785,894	—	—	1	33	34	—	—	1,800	1,213	3,013	43.263	3.834
1943	5	1,019,771	—	—	3	45	48	—	—	4,950	1,123	6,073	47.069	5.955
1944	4	727,496	1	—	1	27	29	6,000	—	2,400	796	9,196	39.863	12.641
1945	7	1,238,845	—	—	2	22	24	—	—	3,000	755	3,755	19.373	3.031
1946	8	1,338,563	2	—	2	31	35	12,000	—	675	1,045	13,720	26.147	10.250
Total	—	11,301,563	8	—	16	398	422	48,000	—	19,800	10,558	78,358	37.340	6.933

¹ See footnotes 1, 2, and 3, Table I.

TABLE V
YEARLY SUMMARY—QUARRIES AND UNDERGROUND MINES IN THE NATIONAL CRUSHED STONE ASSOCIATION SAFETY COMPETITION, 1926-46¹

Year	Plants	Man-hours worked	Number of injuries ¹					Number of days of disability ¹					Frequency rate ¹	Severity rate ¹
			Fatal	P.T.	P.P.	Temp.	Total	Fatal	P.T.	P.P.	Temp.	Total		
1926	43	5,816,909	3	—	6	241	250	18,000	—	9,000	4,772	31,772	42.978	5.462
1927	50	8,195,240	10	—	3	472	485	60,000	—	2,400	7,254	69,654	59.181	8.499
1928	58	8,051,291	9	—	5	390	404	54,000	—	9,000	6,381	69,381	50.178	8.617
1929	57	8,635,845	5	—	6	316	327	30,000	—	6,060	6,150	42,210	37.865	4.888
1930	74	8,608,782	7	—	10	242	259	42,000	—	7,475	4,139	53,614	30.086	6.228
1931	61	5,430,962	4	—	13	202	219	24,000	—	18,660	3,687	46,347	40.324	8.534
1932	42	2,820,300	1	—	4	81	86	6,000	—	6,750	2,646	15,396	30.493	5.459
1933	43	2,934,252	1	—	1	78	80	6,000	—	48	3,242	9,290	27.264	3.166
1934	50	3,536,403	1	—	2	119	122	6,000	—	2,850	2,160	11,010	34.498	3.113
1935	48	4,342,300	2	1	8	80	91	12,000	6,000	9,900	3,264	31,164	20.957	7.177
1936	54	6,733,770	6	—	14	189	209	36,000	—	8,168	4,707	48,875	31.038	7.258
1937	50	6,563,681	7	—	9	139	155	42,000	—	5,875	4,552	52,427	23.615	7.987
1938	50	4,992,561	2	—	6	78	86	12,000	—	6,600	3,317	21,917	17.226	4.390
1939	48	4,612,125	2	—	3	58	63	12,000	—	5,400	2,135	19,535	13.660	4.236
1940	50	4,734,396	1	—	6	86	93	6,000	—	7,050	3,901	16,951	19.643	3.580
1941	51	6,369,155	3	—	6	113	122	18,000	—	10,050	2,435	30,485	19.155	4.786
1942	52	7,964,829	3	2	2	216	223	18,000	12,000	3,300	5,452	38,752	27.998	4.865
1943	39	5,770,085	4	—	8	179	191	24,000	—	12,096	4,985	41,081	33.102	7.120
1944	36	4,723,929	4	—	5	145	154	24,000	—	5,400	4,119	33,519	32.600	7.096
1945	53	7,325,882	—	—	3	157	160	—	—	3,750	4,260	8,010	21.840	1.093
1946	54	8,630,738	3	—	8	228	239	18,000	—	5,816	5,175	28,991	27.692	3.359
Total	—	126,793,435	78	3	128	3,809	4,018	468,000	18,000	145,648	88,733	720,381	31.689	5.682

¹ See footnotes 1, 2, and 3, Table I.

injury-frequency rate of 29.908 per million man-hours and an injury-severity rate of 0.655 per thousand man-hours of exposure to plant hazards.

Accident-Free Plants

The following 11 plants—10 open quarries and 1 underground mine—received honorable mention and were awarded parchment reproductions of the quarry scene on the bronze trophy plaque for operating throughout the year without a disabling injury:

Ohio dolomite quarry, The J. E. Baker Company, Millersville, Sandusky County, Ohio; 110,155 man-hours.

Inwood limestone quarry, The J. E. Baker Company, Inwood, Berkeley County, West Virginia; 86,978 man-hours.

Bakerton limestone mine, The Standard Lime and Stone Company, Bakerton, Jefferson County, West Virginia; 81,319 man-hours.

Blue Mount trap-rock quarry, The J. E. Baker Company, Blue Mount, Baltimore County, Maryland; 79,055 man-hours.

Marquette limestone quarry, Marquette Cement Manufacturing Company, Cape Girardeau, Cape Girardeau County, Missouri; 70,098 man-hours.

Winchester trap-rock quarry, The General Crushed Stone Company, Winchester, Middlesex County, Massachusetts; 69,354 man-hours.

Union Furnace limestone quarry, Warner Company, Tyrene, Huntingdon County, Pennsylvania; 57,822 man-hours.

Plainville No. 4 trap-rock quarry, The New Haven Trap Rock Company, Plainville, Hartford County, Connecticut; 57,690 man-hours.

Middlefield No. 1 trap-rock quarry, The New Haven Trap Rock Company, Middlefield, New Haven County, Connecticut; 49,822 man-hours.

No. 4 trap-rock quarry, Southwest Stone Company, Knippa, Uvalde County, Texas; 46,497 man-hours.

Millerdale limestone quarry, Waterloo Dredging Company, Waterloo, Black Hawk County, Iowa; 28,350 man-hours.

The Competition

The winning plant in the annual National Crushed Stone Association Safety Competition is awarded a bronze plaque on which is portrayed in bas-relief the quarry scene on the pedestal of the "Sentinels of Safety" trophy awarded in the National Safety Competition. The plaque is furnished by the Explosives

Engineer magazine. Each plant in the contest, except the winner, that operates throughout the year without a lost-time injury is given an honorable mention award of a parchment certificate which is a reproduction of the bronze plaque. In addition, each employee of an accident-free plant is presented with a Certificate of Honor.

This annual Competition for the promotion of safety in the crushed stone industry is conducted under the same rules as the National Safety Competition and the same records are used in both contests. There are two additional qualifications for the crushed stone competition which are that the operation must have commercial production of crushed stone and that the company be a member of the Association. Of the 494 enrolled operations in the 1946 National Safety Competition, 54 were operated by companies that are members of the National Crushed Stone Association.

The following 16 States were represented in the 1946 contest:

State	No. of plants	State	No. of plants	State	No. of plants
California	1	Michigan	2	Pennsylvania	12
Connecticut	3	Missouri	3	Texas	2
Illinois	3	New Jersey	2	Virginia	4
Iowa	1	New York	9	West Virginia	4
Maryland	3	Ohio	3		
Massachusetts	1	Oklahoma	1		

Forty-four plants enrolled in the 1946 Competition were also enrolled in 1945. Seven of these plants had accident-free records in both years; 15 had better severity rates in 1946; and 22 had worse severity rates in 1946. The following is a comparison of these identical plants:

Year	Man-hours worked	Total number of injuries	Total number of days of disability	Frequency rate	Severity rate
1945	6,527,090	142	7,688	21.755	1.178
1946	7,250,999	184	25,790	25.376	3.557

Year	Number of injuries					Number of days of disability				
	F.	P.T.	P.P.	Temp.	Total	F.	P.T.	P.P.	Temp.	Total
1945	3	139	142	3,750	3,938	7,688
1946	3	..	7	174	184	18,000	..	3,416	4,374	25,790

Causes of Accidents

Fifty-two per cent of the accidents at the 54 crushed stone plants resulted from handling materials or objects, falls of persons, and haulage, as shown in Table VI. Hand tools, falling objects, and machinery

TABLE VI

NUMBER OF INJURIES, BY CAUSES, AT QUARRIES
AND UNDERGROUND MINES IN THE NATIONAL
CRUSHED STONE ASSOCIATION SAFETY
COMPETITION IN 1946

Cause	Fatal	Permanent		Tempo- rary	Total
		Total	Partial		
Falls and slides of rock	2	—	1	5	8
Handling materials or objects	—	—	—	53	53
Hand tools	—	—	—	21	21
Explosives	—	—	—	1	1
Haulage	—	—	3	21	24
Falls of persons	1	—	—	38	39
Bumping against objects	—	—	—	6	6
Falling objects	—	—	1	20	21
Flying objects or particles	—	—	—	7	7
Electricity	—	—	—	2	2
Drilling	—	—	1	11	12
Machinery	—	—	2	12	14
Stepping on objects	—	—	—	4	4
Burns	—	—	—	6	6
Other causes	—	—	—	5	5
Total	3	—	8	212	223
Not stated	—	—	—	16	16
Grand total	3	—	8	228	239

TABLE VII

DAYS OF DISABILITY BY CAUSES OF INJURIES AT
QUARRIES AND UNDERGROUND MINES IN THE
NATIONAL CRUSHED STONE ASSOCIATION
SAFETY COMPETITION IN 1946

Cause	Fatal	Permanent		Tempo- rary	Total
		Total	Partial		
Falls and slides of rock	12,000	—	600	320	12,920
Handling materials or objects	—	—	—	880	880
Hand tools	—	—	—	224	224
Explosives	—	—	—	10	10
Haulage	—	—	2,741	713	3,454
Falls of persons	6,000	—	—	1,212	7,212
Bumping against objects	—	—	—	99	99
Falling objects	—	—	1,800	437	2,237
Flying objects or particles	—	—	—	43	43
Electricity	—	—	—	47	47
Drilling	—	—	150	424	574
Machinery	—	—	525	490	1,015
Stepping on objects	—	—	—	24	24
Burns	—	—	—	77	77
Other causes	—	—	—	30	30
Total	18,000	—	5,816	5,030	28,846
Not stated	—	—	—	145	145
Grand total	18,000	—	5,816	5,175	28,991

TABLE VIII

AVERAGE DAYS OF DISABILITY PER TEMPORARY INJURY AT PLANTS ENROLLED IN THE NATIONAL
CRUSHED STONE ASSOCIATION SAFETY COMPETITION

Year	Underground mines			Open quarries			Total		
	No. of temporary injuries	No. of days of disability	Av. days of disability	No. of temporary injuries	No. of days of disability	Av. days of disability	No. of temporary injuries	No. of days of disability	Av. days of disability
1926	34	533	16	207	4,239	20	241	4,772	20
1927	14	68	5	458	7,186	16	472	7,254	15
1928	68	888	13	322	5,493	17	390	6,381	16
1929	30	617	21	286	5,533	19	316	6,150	19
1930	15	468	31	227	3,671	16	242	4,139	17
1931	4	147	37	198	3,540	18	202	3,687	18
1932	6	165	28	75	2,481	33	81	2,646	33
1933	11	349	32	67	2,893	43	78	3,242	42
1934	13	287	22	106	1,873	18	119	2,160	18
1935	3	249	83	77	3,015	39	80	3,264	41
1936	7	117	17	182	4,590	25	189	4,707	25
1937	3	91	30	136	4,461	33	139	4,552	33
1938	2	133	67	76	3,184	42	78	3,317	43
1939	7	457	65	51	1,678	33	58	2,135	37
1940	8	888	111	78	3,013	39	86	3,901	45
1941	15	169	11	98	2,266	23	113	2,435	22
1942	33	1,213	37	183	4,239	23	216	5,452	25
1943	45	1,123	25	134	3,862	29	179	4,985	28
1944	27	796	29	118	3,323	28	145	4,119	28
1945	22	755	34	135	3,505	26	157	4,260	27
1946	31	1,045	34	228	5,175	23	259	6,220	24
Total	398	10,558	27	3,442	79,220	23	3,840	89,778	23

(Continued on Page 18)

A Report on the Condition of the Experimental Bituminous Surface Treatments on Route 9-W, South of Albany, N. Y., after Four Years of Heavy Service

By **A. T. GOLDBECK**

Engineering Director
and

J. E. GRAY

Field Engineer

NATIONAL CRUSHED STONE ASSOCIATION
Washington, D. C.

IN THE June 1944 issue of *The Crushed Stone Journal* there were described a series of tar surface treatments constructed in September 1942, on an old concrete pavement. These experimental sections were laid on New York Route 9-W, south of Albany, near Bethlehem Center. It now seems appropriate to report on their service condition after about four years of very heavy mixed traffic, a high percentage of which consisted of heavy motor trucks operated at high speed. The inspection upon which this report is based was made by J. E. Gray in company with Edward Stickney, Deputy District Engineer (District No. 1), Edward Delahanty of the State Highway Department, who had charge of the original construction for the State and Harry R. Hayes, Engineer-Director of the New York State Crushed Stone Association.

The remarks and conclusions regarding the various sections are substantially as reported by Mr. Gray and further comments are made by Mr. Goldbeck who aided in the original construction. For the sake of completeness and to permit of comparing the results, a short resumé of the various sections is given in Table I. More complete details of these sections were published in *The Crushed Stone Journal* for June, 1944.

The following comments were submitted by Mr. Gray as a result of his inspection:

SECTION 1 West: Surface quite worn but satisfactory. More wear on curves than on tangents.

SECTION 1 East: Surface treatment completely worn off.

SECTION 2 West and East: Surface in fair shape and quite granular in appearance.

SECTION 3 West and East: Both sides failed badly. Concrete base probably a contributing factor, for concrete has scaled badly, cracked and road is mud pumping.

SECTION 4 West and East: Surface failed—not enough aggregate. West side has retained more aggregate than east side.

SECTION 5 West and East: Surface very thin. Size No. 2 stone offered no advantage; large stone has polished and does not add to skid resistance. The 25 lb. treatment of No. 1 stone was more effective than a 35 lb. treatment of mixed No. 1 and No. 2.

SECTION 6 West and East: Best of the single surface treatments. Worn quite thin, especially along center line. (See Fig. 1.) No. 2 size causes knobby appearance and probably is not as effective as uniform, fine textured surface in preventing skidding.



FIGURE 1
General View of Single Surface Treatment Sections 5 and 6 Showing the Wear in the Traffic Lane

SECTION 7 West and East: In good condition, but, again, No. 2 stone presents a polished, knobby surface.

SECTION 8 West and East: Good condition, has a finer textured surface than in the case of the No. 1 stone surfaces.

Table I

**DATA ON EXPERIMENTAL BITUMINOUS SURFACE TREATMENTS
ON CONCRETE PAVEMENT NEW YORK STATE ROUTE 9-W, SOUTH OF ALBANY, N. Y.
SEPTEMBER 18-25, 1942**

Test sections start at about 2.5 miles south of intersection of New York Routes 9-W and 32 (Bethlehem Center School or Glenmont P. O.) and end about 0.25 miles north of intersection

Section Number and Side of Road	Aggregate	Single or Double Surface Treatment	Nominal Quantities of Materials in order of application (See Note 1)						Number of Times Rolled		
			1st		2nd		3rd		1st	2nd	3rd
			Tar	Aggregate	Tar	Aggregate	Tar	Aggregate			
1 West	Limestone	Single	0.25	25 (No. 1)					10		
1 East	Limestone	Single	0.25	25 (No. 1)					2		
2 West	Tailings	Single	0.25	30 (No. 1)					4		
2 East	Tailings	Single	0.25	30 (No. 1)					4		
3 West	Limestone	Single	0.25	30 (No. 1)					1		
3 East	Limestone	Single	0.25	30 (No. 1)					1		
4 West	Tailings	Single	0.25	25 (No. 1)					1		
4 East	Tailings	Single	0.25	25 (No. 1)					1		
5 West	Limestone	Single	0.3	40 (Mixture X)					10		
5 East	Limestone	Single	0.3	40 (Mixture X)					10		
6 West	Tailings	Single	0.3	40 (Mixture X)					4		
6 East	Tailings	Single	0.3	40 (Mixture X)					4		
7 West	Limestone	Double	0.4	50 (Mixture X)	0.25	25 (No. 1)			4-6	6	
7 East	Limestone	Double	0.4	50 (Mixture X)	0.25	25 (No. 1)			4-6	6	
8 West	Tailings	Double	0.4	50 (Mixture X)	0.25	25 (No. 1)			4-6	6	
8 East	Tailings	Double	0.4	50 (Mixture X)	0.25	25 (No. 1)			4-6	6	
9 West	Limestone	Single		20 (No. 2)	0.45	30 (Mixture Y)				6	
9 East	Limestone	Single		20 (No. 2)	0.45	30 (Mixture Y)				5	
10 West	Tailings	Single		20 (No. 2)	0.45	30 (Mixture Y)				6	
10 East	Tailings	Single		20 (No. 2)	0.45	30 (Mixture Y)				6	
11 West	Limestone	Double		20 (No. 2)	0.35	20 (No. 1)	0.15	10 (No. 1A)		1	4
11 East	Limestone	Double		20 (No. 2)	0.35	20 (No. 1)	0.15	10 (No. 1A)		1	4
12 West	Tailings	Double		20 (No. 2)	0.35	20 (No. 1)	0.15	10 (No. 1A)		3	2
12 East	Tailings	Double		20 (No. 2)	0.35	20 (No. 1)	0.15	10 (No. 1A)		2	2
13 West	Limestone	Double	0.25	25 (Mixture Y)	0.25	25 (Mixture Y)			2	3	
13 East	Limestone	Double	0.25	25 (Mixture Y)	0.25	25 (Mixture Y)			2	3	
South 500 ft.			0.25	25 (Mixture Y)	0.20	25 (Mixture Y)			2	3	
North 500 ft.			0.25	25 (Mixture Y)	0.25	25 (Mixture Y)			2	3	
14 West	Recrushed Limestone	Single	0.3	40 (Mixture X)					6		
14 East	Recrushed Limestone	Double									
South			0.25	40 (Mixture X)	0.15	15 (No. 1A)			3	6	
North 374 ft.			0.25	30 (Mixture X)	0.15	15 (No. 1A)			6	10	
15 West	Recrushed Limestone	Single		20 (No. 2)	0.45	30 (Mixture Y)			6		
15 East	Recrushed Limestone	Single									
South 550 ft.				20 (No. 2)	0.45	30 (Mixture Y)				10	
North 200 ft.		Double		20 (No. 2)	0.35	30 (Mixture Y)	0.15	10 (No. 1)		10	

Note 1: Tar quantities are gallons per square yard. Aggregate quantities are pounds per square yard. Actual quantities used differed somewhat from the above stated nominal quantities (See *The Crushed Stone Journal* for June 1944). Tar used: N. Y. State item 73a—grade B—AASHO Std. RT-8 (Float test at 32° F. = 80–120). Aggregate Size Numbers are New York Highway Designations shown below:

Sieve Sizes	Percent Passing		
	No. 2	No. 1	No. 1A
1 1/2	100		
1	90-100	100	
3/4	0-15	90-100	100
3/8		0-15	90-100
3/16			0-15

Mixture X: consists of 1/2 No. 2 and 3/4 No. 1.
Mixture Y: consists of 4/5 No. 1 and 1/5 No. 1A.

SECTION 9 West: West side intact but has a knobby, polished surface. (See Fig. 2.)

SECTION 9 East: East side has failed—completely worn off on the curve and is not as good as Section 7 or 8.

SECTION 10 West and East: Surface intact but has an undesirable, knobby surface.

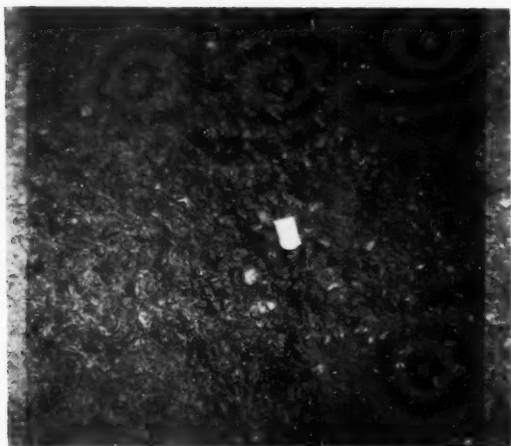


FIGURE 2

A Close-Up View of Double Surface Treatment Section 9, Showing the Knobby Surface Due to Large Size Aggregate

SECTION 11 West and East: No. 1 stone has worn off leaving a knobby surface. Surface is durable but the knobby surface is undesirable.

SECTION 12 West and East: Good condition, about same as Section 11, with perhaps more No. 1 size remaining.

SECTION 13 West and East: This is outstandingly the best section of the entire series. It has a fine textured, sand-paper surface and resembles a plant mix. (See Fig. 3.) There is no excess of tar on the surface and yet the aggregate is well cemented in place. The aggregate has not become ground or pulverized and has not polished. Traffic rides on the stone and not on the tar. All were unanimously of the opinion that this was the most desirable surface treatment of the experimental sections. The north end is a little blacker than the south end, but is not considered to be too "fat". The shoulders are slightly fat—perhaps due to the flow of the tar.

SECTION 14 West and East: West Side, South End: Worn and not nearly as good as the east side.

East Side, South End: Surface is a flat mosaic with tar flush with the stone. This might be considered to be a triple fat.

North End Beyond Intersection: Both sides good except for wear along center line.

SECTION 15 West and East: Section quite worn. North 200 ft. is in good condition.

General Observations Based on Inspection

1. There was no bleeding in any of the test sections. In the single surface treatments, as long as any treatment remained there was an aggregate rather than a tar surface to carry the traffic, thus indicating that the proportion of tar to aggregate was about correct.

2. Double surface treatments were outstandingly more durable than single treatments.

3. During the approximately four years of service there is no record of a serious traffic accident due to skidding, even though there are several curves in the $2\frac{1}{2}$ mile stretch of experimental road surfaces.

4. Increased costs due to innovations in construction procedure, such as in Sections 9 to 12, or in the processing of aggregates, such as in Sections 14 and 15, are apparently not justified by the service results obtained.

5. The use of large size aggregate (No. 2) has proven to be objectionable due to the development of a knobby surface which may be conducive to skidding.

6. The fine graded double surface treatment (Section 13) was outstandingly the best section. It seems



FIGURE 3

Section 13. The Best Section. A Fine Textured, Durable, Non-Skid, Double Surface Treatment

to be durable and has a non-skid surface texture. It consists of an application of 0.25 gal. of tar, covered with 25 lb. per sq. yd. of $\frac{1}{2}$ to $\frac{3}{8}$ in. aggregate (80 per cent of No. 1 and 20 per cent of No. 1A). This first treatment was rolled lightly and a second treatment identical with the first was given immediately and rolled.

Agricultural Limestone Division Expands Promotional Activities—Prepares Series of Ads for Members

IN LINE with action of its Board of Directors, the Agricultural Limestone Division of the National Crushed Stone Association recently has taken another long step forward toward its goal of developing a well-rounded promotional program for its member companies.

The latest project completed is a series of 15 newspaper ads which tell the soil-liming story in crisp, clear language easy for the farmer to read and understand. The message carried by most of these ads is broadly applicable to all sections of the country. Only two of them, "More Cotton Money" and "Lime Your Pastures," are limited in use to areas where cotton growing or good pastures are an important part of the agriculture.

The ads are being offered to members of the Division in sets and singly. Orders already received indicate that most members are interested in obtaining full sets of the 15 ads at \$25.00 per set. By so doing, they have on hand for instant use a variety of well-illustrated advertising messages which they can hand to their printer on a moment's notice.

The illustration on the next page shows the titles and parts of some of the ads that comprise the series. A complete list of the titles is as follows:

Farming is Like Banking
This Robber Works the Year Round
When You Sell Your Crops . . .
There Goes . . . What?
In 50 Years Hunger & Disaster
How Limestone Helps Keep Your Farm
Productive
313 Days to Apply Limestone
Let's Figure the Cost of Liming
Liming is an Inexpensive Farm Operation
Liming is Profitable
Maybe Your Farm Doesn't Need Liming
Crops Look Yellow?
Limestone Makes Protein
More Cotton Money
Lime Your Pastures

It will be recognized that by breaking down the soil-liming story into its component parts a most interesting series of brief messages has been produced—one that permits the advertiser to insert in his

local paper a different ad each week for nearly four months, or every other week for nearly eight months.

As the experience of the industry becomes measurable from the use of these ads, it is proposed to add to the series by preparing messages on the use of limestone for specific crops. Corn, soybeans, wheat, oats, hay, orcharding, and truck crops can thus be dealt with in a manner that will tie the liming story to a particular crop.

The Agricultural Limestone Division is carrying a stock of the mats in the popular 2-column by 6-inch size and is in position to fill all orders promptly.

Invisible Ink Cards

The preparation of the ads is but one of several promotional devices that have been produced by the Division for its members. The first such selling aid was an invisible ink post card which must be dipped into water to reveal the message which again disappears when the card dries. Although it may be classed as novelty advertising, its tricky feature has

WATER does funny things to this card

What it does to farmland is serious.

It makes soil "acid" or "sour" by leaching out the lime at the rate of 300 to 500 pounds per acre every year.

The first rule in profitable farming is to replace that which is lost. Do this with our agricultural limestone and acidity will disappear like this message.

(Company name and address)

resulted in its wide use. To date over 135,000 copies have been bought by member companies. When the card is made wet the above message is revealed.

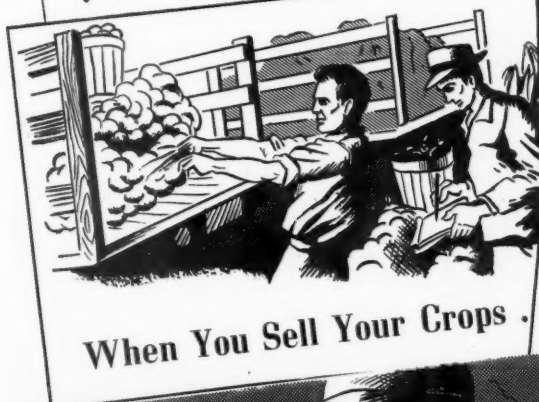
Folders Are Popular

The most popular selling help that has thus far been developed by the Division is the series of three folders. Each one is printed in two colors and each tells the soil-liming story somewhat differently.

- Shown here are some of the ads prepared by the Agricultural Limestone Division for promoting the use of agricultural limestone.



FARMING IS LIKE
Banking

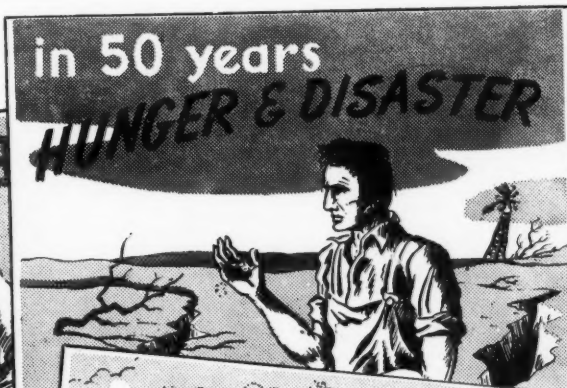


When You Sell Your Crops .

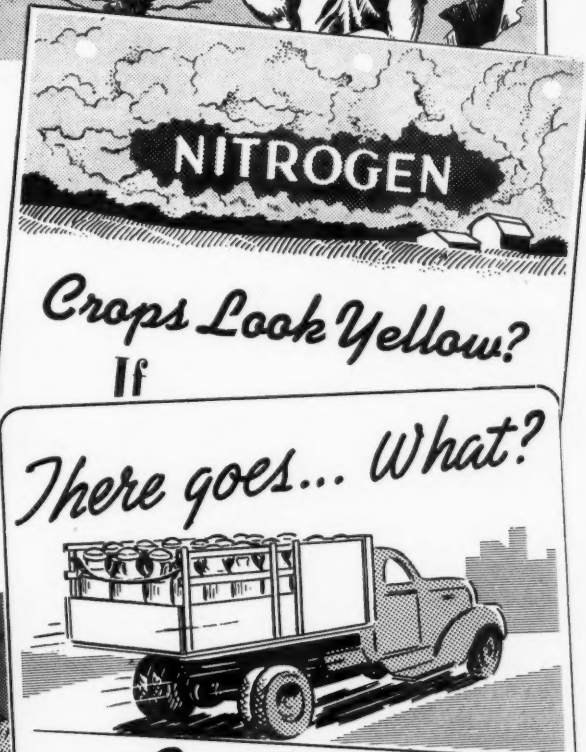


**THIS ROBBER WORKS
THE YEAR ROUND**

R is a soil robber. As
a + dissolv

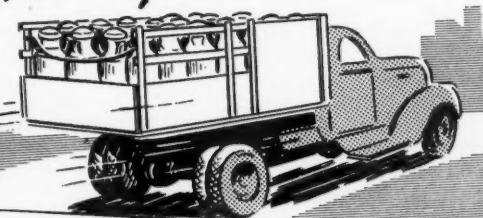


**in 50 years
HUNGER & DISASTER**



NITROGEN

Crops Look Yellow?
If
There goes... What?




Liming
IS PROFITABLE

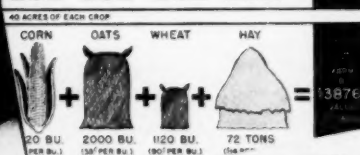
These three folders issued by the Agricultural Limestone Division are being widely used by members to promote the use of agricultural limestone.

Agricultural Limestone

The Farmers Friend

Repair and Rebuild WITH LIMESTONE and LEGUMES

COST OF FAILURE TO USE LIME



WHY PASTURES NEED LIMING

Almost all permanent pastures need liming. Most of them have been neglected so long that the soils are deficient in all the mineral elements, especially calcium, magnesium, phosphorus, and potash, which are required for the growth of the more nutritious and palatable grasses and legumes. Hundreds of experiments conducted by authorities in all parts of the Nation testify to the important role that legumes, such as the clovers and lupines, play in really good pasturage.

It is generally agreed that the first step in pasture improvement is the application of agricultural limestone. It corrects the acid conditions that has developed through years of neglect, stimulates the biological activity of the soil, particularly the nitrogen-forming processes, renders and keeps other plant foods like phosphorus more available, and improves the soil structure.

Calcium and phosphorus are the two bone-building elements so necessary in the production of healthy, profitable livestock. Most pasture soils are deficient in both of them and, consequently, the forage is deficient in structure. Agricultural limestone may be applied to pastures any time of the year, but the best time of the year to perform this operation is during the summer, especially when the ground is reasonably dry and the pasture is being grazed.

For that reason, summer and fall liming are preferred. Top-dressing during the summer is especially advantageous if the pasture is to be improved by the simple process of top-dressing existing turf, either summer or fall liming is recommended. This permits the action of freezing and thawing, winter rain and melting snow to carry the material down into the root zone where it can partly condition the soil prior to the next grazing season.

Your county agricultural agent will inform you on the rate of application and give you other pertinent information on pasture improvement for your locality.

This chart, comparing two hypothetical farms of 160 acres, is based on 26 years of results obtained on limed and unlimed plots at Carthage Soil Experiment Field in Illinois. The putations made by the University of Illinois on the use of limestone on Farm B results in 50% increase in yield and production.

Most soils are usually acid or can be corrected with the application of agricultural limestone. It is a simple matter to find out at least one soil sample (half a bushel) to plow depth from each acre or from a 1/4 acre. Your County Agricultural Agent or Vocational Agriculture Teacher can tell you where to get it tested so you will know how much limestone to apply. The county AAA office will assist you in getting at least part of the limestone you need.

Lime Your Pastures

These folders, illustrated on page 14, are used in a number of ways. Some members use them as a direct mail piece; others use them as envelope stuffers; a few companies have used them to hand out at country fairs and other gatherings. Perhaps one of the best ways to use them is to hand one to a farmer each time a limestone order is delivered.

This latter method of distribution is called "point-of-sale" advertising. It has the advantage of placing in the hands of the buyer an attractive piece of literature that gives him authoritative information on the product he has just bought, and serves to convince him that his purchase was a wise one. We all like to think that we spend our money wisely. It's smart selling to help our customers think so.

Truckers Can Be Helpful

A number of agricultural limestone producers dispose of practically all of their material by selling it to truckers. However, the actual demand comes from the farmers. In such circumstances obviously it is to the producer's interest to enlist the aid and cooperation of the trucker in distributing promotional materials to the farmers served by him.

The observation has been made that many truckers haven't the slightest idea why a farmer would want to buy "ground rock" to put on his land. If he would both read and distribute these folders and other pertinent literature, he'd have much more pride in his business and be a valuable salesman for himself and the producer whose material he is distributing.

There are, of course, any number of methods and devices that are being used successfully to stimulate sales and supplement personal sales effort and the work of county and community AAA field men. What has thus far been done by the Division, as described in this article, is a good beginning. Indications are that the selling of agricultural limestone will become more and more competitive and that producers in their own self-interest will have to give increasing attention to selling and merchandising their product. The Division stands ready to serve its membership by continuously expanding its promotional campaign as rapidly as circumstances will permit.

Highway Program Deferred to Relieve Car Shortage

MAJOR General Philip B. Fleming, Federal Works Administrator, reported on December 17, 1947 to John R. Steelman, assistant to the President, that steps have been taken by the Public Roads Administration and State highway departments to cooperate in every possible way in the Nationwide effort to relieve the current coal car shortage.

Pointing out that the Nation faces a possible shortage of coal during the winter months because of the lack of transportation facilities, Mr. Steelman requested the Public Roads Administration of the Federal Works Agency to ask State highway departments to defer the construction of "less urgent" highway projects requiring rail haul of aggregates until next spring, in order to release as many cars as possible for the hauling of coal for home and industrial use.

Although most of the stone, gravel and sand required for highway construction and maintenance is obtained from "local" sources and hauled by truck, the State highway departments have informed the Public Roads Administration that road building activities calling for materials generally hauled in cars that might be used for the transportation of coal will be restricted during the next three months to essential highway projects. Northern States already have suspended normal highway construction for the winter.

Public Roads Commissioner Thomas H. MacDonald advised General Fleming that 18 State highway departments will not initiate additional construction before March 1. Thirteen States have agreed to reduce to a negligible amount the number of highside gondola and hopper cars used for the transportation of highway materials.

The remaining States and the District of Columbia will cooperate by requesting low bidders on November contract lettings to specify other types of freight cars for necessary materials, by using trucks for hauling whenever possible, by the use of lowside gondola cars on short hauls, by curtailing maintenance operations, and by opening quarries and pits near construction sites to produce stone and gravel for highway work performed by State and county forces.

National System of Interstate Highways Approved

ROUTES selected by the State highway departments for inclusion in a national system of interstate highways have been approved with few changes by Federal Works Administrator, Major General Philip B. Fleming, the Public Roads Administration of the Federal Works Agency has announced.

The new interstate system as mapped by the State highway departments, in cooperation with the Public Roads Administration, comprises the most heavily traveled highways in the present Federal-aid system, and includes extensions of the system through urban areas.

Final designation of routes in the system was reached after careful consideration of proposed routes and a series of conferences between representatives of State highway departments and field officers of Public Roads to settle differences involving proposed alternate routes and connections at State lines.

The integrated system, as approved by the Federal Works Administrator, consists of north-and-south, east-and-west, and diagonal routes that will make it possible to travel from any section of the country to any other section by a direct route.

The system contains 37,681 miles of the Nation's principal highways, including 2,882 miles of urban thoroughfares. Additional urban circumferential and distributing routes are to be designated later, and 2,319 miles have been reserved for these routes.

The approved map shows the general location of all routes. Principal cities to be connected are indicated but details of the exact location are left for determination as construction projects are planned.

Rural sections of the interstate system comprise only 1.1 per cent of all rural roads but carry 20 per cent of all rural traffic. The system reaches 42 State capital cities and will serve directly 182 of the 199 cities in the country having a population of 50,000 or more persons. Average traffic on routes comprising the system, exclusive of urban sections, was 2,693 vehicles per day in 1941 as compared with 1,439 on the Federal-aid system, 972 on State highways and 155 on all rural roads.

In many large cities depressed or elevated expressways will be built, making possible city travel at an

average speed of 35 to 45 miles an hour, without stops for traffic signals and free of interference by cross-traffic. Depressed portions of expressways will be supplemented by parallel frontage roads for "local" traffic, and bridges will be constructed at intersections to serve cross-traffic. The urban expressways will be integral parts of the national interstate system.

In recommending routes for inclusion in the system, State highway departments were governed by provisions of the Federal-aid Highway Act of 1944, which required that "there shall be designated in the continental United States a national system of interstate highways not exceeding 40,000 miles in extent, so located as to connect by routes as direct as practicable the principal metropolitan areas, cities and industrial centers, to serve the national defense and to connect at suitable border points with routes of continental importance in the Dominion of Canada and the Republic of Mexico."

The act further required that "the routes of the national system of interstate highways shall be selected by joint action of the State highway departments of each State and the adjoining States," and in another provision required approval by the Federal Works Administrator.

The Federal-aid Highway Act of 1944 authorized \$500,000,000 in each of the three fiscal years following the war to assist the States in developing a three billion dollar highway program which would include improvements on the regular Federal-aid system, on highways in urban areas where the population is 5,000 or more, and on a Federal-aid system of secondary or farm-to-market roads in each State.

The sum of \$225,000,000 was set aside from the authorized annual appropriation for improvements on highways in the regular Federal-aid system; \$125,000,000 was made available for urban sections of the system only, including expressways, circumferential and distribution routes; and \$150,000,000 was earmarked for State systems of secondary roads.

No specific sum was provided for development of the national interstate system; however, since the system is made a part of the Federal-aid system, the amounts provided for this system are available for



PUBLIC ROADS ADMINISTRATION
FEDERAL WORKS AGENCY

NATIONAL SYSTEM OF INTERSTATE HIGHWAYS
SELECTED BY JOINT ACTION OF THE SEVERAL STATE HIGHWAY DEPARTMENTS
AS MODIFIED AND APPROVED
BY THE ADMINISTRATOR, FEDERAL WORKS AGENCY
AUGUST 2, 1947

the interstate system. The appropriations authorized have already been apportioned among the States.

In most States half of the cost of Federal-aid projects and up to one-third of the cost of right-of-way may be financed by the Federal Government. The exceptions are States containing large areas of land in the public domain where a higher rate of Federal participation is permitted.

Although the new interstate system follows, in general, the principal routes in the present Federal-aid system, it may be necessary in many instances to relocate existing highways or build alternate routes for express traffic in order to meet essential standards of width, grade, alinement, and control of access, Public Roads Commissioner Thomas H. MacDonald said.

Routes included in the system, as well as the adopted standards of design and construction, conform in broad outline to recommendations contained in the report submitted to President Roosevelt in

1944 by the National Interregional Highway Committee, of which Commissioner MacDonald was chairman.

Design standards for the system approved by the American Association of State Highway Officials on August 1, 1945, call for four-lane divided highways wherever the traffic volume is 800 motor vehicles in peak hours. For such highways in rural areas, a right-of-way of 250 feet is advocated as desirable. Traffic lanes 12 feet wide are recommended on all heavily traveled routes. Where traffic density exceeds 3,000 vehicles in peak hours, elimination of all cross traffic at grade is advocated.

Control of access to the interstate routes, particularly in and near cities, is considered essential. Large streams of traffic cannot move swiftly and safely if obstructed continually by vehicles entering and leaving an express route. Access points are to be placed as frequently as they are needed, but accomplishment of the main objective prevents permitting ac-

cess at every cross road or street, business place, or residence. Many States do not yet have adequate legal authority to control access.

The National Interregional Highway Committee's report was transmitted to Congress by the President on January 12, 1944, and in December of that year Congress enacted legislation requiring that the interstate system be designated and authorizing Federal appropriations for highway construction in the first three post-war fiscal years.

State highway departments were requested to select routes for inclusion in the national interstate system and replies were received from all States in 1945. Since that time representatives of State highway departments and the Public Roads Administration have been engaged in ironing out differences concerning alternate routes and connections at State boundaries.

Meanwhile work has been started on improvements on sections of the Federal-aid system included in the national interstate system, for which plans had been completed prior to V-J Day. Commissioner

MacDonald emphasized, however, that development of a national interstate system of highways embodying standards of design recommended by the Public Roads Administration and the American Association of State Highway Officials is a long-range program to be carried out over a period of years.

Tennessee Companies Consolidate

THE formation of a new company to be known as the Franklin Limestone Company, Inc., has been announced by Cale P. Haun and Henry E. Rodes, which company has purchased the plants and quarries formerly operated by the Franklin Limestone Company, the Middle Tennessee Stone Company, and the West Tennessee Limestone Company.

The officers of the new corporation are Cale P. Haun, President; A. B. Rodes, Vice President and General Manager; and F. I. Morgan, Secretary. The Directors of the new corporation are Henry E. Rodes, A. B. Rodes, Cale P. Haun, Mrs. Julia Fay Haun, W. Joe Wallace, and Lawrence Howard.

The National Crushed Stone Association Safety Competition of 1946

(Continued from Page 8)

were the succeeding most frequent causes of disabling injuries. Falls and slides of rock, falls of persons, and haulage accounted for 82 per cent of the days of disability.

Summary of Tables

Tables I and II show the relative standing of the open quarries and underground mines, arranged in ascending order of accident-severity rates of the plants. When two or more plants have accident-free

records, the number of man-hours governs the order. Tables III and IV show yearly summary figures from 1926 to 1946. Table V shows a yearly combined summary of open quarries and underground mines in the Competition. The number of injuries by causes and the days of disability by causes of injuries are shown in Tables VI and VII. Table VIII gives the average days of disability for temporary injuries at mines and quarries enrolled in the contest. Table IX gives employment and accident data for crushed stone plants enrolled in the National Crushed Stone Association Safety Competition, 1945 and 1946, covering identical plants for both years and plants enrolled only in 1945 and 1946.

TABLE IX
EMPLOYMENT AND ACCIDENT DATA FOR CRUSHED STONE PLANTS ENROLLED IN THE NATIONAL CRUSHED STONE ASSOCIATION SAFETY COMPETITION, 1945 AND 1946, COVERING IDENTICAL PLANTS FOR BOTH YEARS AND PLANTS ENROLLED ONLY IN 1945 OR IN 1946

	No.	Man-hours worked	Number of injuries ¹					Days of disability ¹					Frequency rate ¹	Severity rate ¹
			F.	P.T.	P.P.	Temp.	Total	F.	P.T.	P.P.	Temp.	Total		
Plants enrolled in 1945 only.....	9	798,792	—	—	—	17	17	—	—	—	320	320	27.373	0.515
Identical plants, enrolled both years, 1945.....	44	6,704,821	—	—	3	140	143	—	—	3,750	3,940	7,690	21.328	1.147
Identical plants, enrolled both years, 1946.....	44	7,510,346	3	—	7	174	184	18,000	—	3,416	4,374	25,790	24.500	3.434
Plants enrolled in 1946 only.....	10	1,379,739	—	—	1	54	55	—	—	2,400	801	3,201	39.863	2.320

¹ See footnotes 1, 2, and 3 in Table I.

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